

**CLAIMS**

1. A method of removing contaminants from a stream of carbon dioxide (CO<sub>2</sub>), comprising:  
contacting a stream of CO<sub>2</sub> with a quantity of at least one mixed metal oxide for a period of time to reduce the contaminant content of the stream.

2. The method as in claim 1, wherein the contaminant content is reduced to not more than 100 parts per billion (ppb).

3. The method as in claim 1, wherein the contaminant content is reduced to not more than 10 ppb.

4. The method as in claim 1, wherein the contaminant content is reduced to not more than 1 ppb.

5. The method as in claim 1, wherein the mixed metal oxide comprises metals having different oxidation states.

6. The method as in claim 1, wherein the mixed metal oxide comprises metals having different electronegativities.

7. The method as in claim 1, wherein the mixed metal oxide comprises metals having different coordination environments.

8. The method of claim 1, wherein the mixed metal oxide is selected from a group comprising: copper (Cu) and zinc oxide (ZnO); iron (Fe) and manganese oxide (MnO<sub>x</sub>); nickel oxide (NiO) and titanium oxide (TiO<sub>x</sub>); palladium oxide (PdO<sub>x</sub>) and cerium oxide (CeO<sub>x</sub>); and vanadium oxide (VO<sub>x</sub>).

9. A method for activation and regeneration of mixed metal oxide adsorbents for the purification of carbon dioxide (CO<sub>2</sub>) comprising:

heating the adsorbent to a first temperature to release contaminants  
adsorbed thereto;

exposing the heated adsorbent to an oxidizing agent to oxidize the  
adsorbent;

cooling the adsorbent to a second temperature; and  
exposing the cooled adsorbent to a reducing agent to produce a mixed  
metal oxide.

10. The method of claim 9, wherein the first temperature is between  
about 300°C to about 550°C.

11. The method of claim 10, wherein the first temperature is about  
400°C.

12. The method as in claim 9, wherein the oxidizing agent comprises  
oxygen (O<sub>2</sub>).

13. The method as in claim 9, wherein the second temperature is  
between about 100°C to about 250°C.

14. The method as in claim 9, wherein the reducing agent comprises a  
mixture of hydrogen (H<sub>2</sub>) and an inert gas.

15. The method as in claim 14, wherein the hydrogen gas comprises  
between about 1% to about 5% of the mixture by volume.

16. The method in claim 14, wherein the inert gas is selected from the  
group consisting of nitrogen (N<sub>2</sub>) and argon and combinations thereof.

17. A method for continuous purification of carbon dioxide (CO<sub>2</sub>),  
comprising:

purification of CO<sub>2</sub> by the method of claim 1 in a first bed of a dual bed

purifier apparatus;

2 regeneration of an adsorbent in a second bed of the dual bed purifier  
apparatus by the method of claim 9, during the coincident purification of the

4 CO<sub>2</sub> in the previous step; followed by

6 purification of CO<sub>2</sub> by the method of claim 1 in the second bed after  
completion of regeneration of the adsorbent by the method of claim 9,  
coincident with the regeneration of the adsorbent of the first bed by the

8 method of claim 9; and

repeating the steps for continuous purification.